Research in the Polar Regions

The Arctic and Antarctica hold interest for many types of researchers. For example, glaciologists study the ice and snow, while oceanographers look at the oceans. The ice, snow, and oceans in the Arctic and Antarctica are changing as a result of global warming and affect the global climate. Biologists research the plants and animals, which are specially adapted to the polar regions and are some of the first in the world to be affected by climate change. Social science researchers study the economics and policies influencing the polar regions, and the people of the Arctic, who are being affected by environmental changes. Other types of researchers who work in the polar regions include geologists, geographers, astronomers, oceanographers, and climatologists.

How do researchers study the polar regions? They live in or visit the regions and observe and take measurements from towns, permanent research stations, temporary field stations, or ships. Researchers can also collect data from satellites and from automated ground instruments that monitor conditions in remote locations.

Matilda Hallerstig

Arctic research: a young researcher's view

"It is hard to imagine how much work lies behind the data we collect. First, a ship, strong enough to sail through ice, with crew and loads of instruments and equipment has to get to the area of interest. Then all the heavy instruments have to be carried to their places, set up and connected to power supply. A lot of holes have to be drilled in the ice and someone has to watch for bears all the time. Layers of warm clothes have to get on and off every time you go in and out, and often you work in shifts so you have to get up in the middle of the night to do measurements. And if weather or ice conditions get bad all this effort might be for nothing. But you never give up."

– Matilda Hallerstig

Matilda Hallerstig

Matilda Hallerstig is a Swedish university student. As part of her meteorology and oceanography studies, she participated in a two-week research trip on a ship. During the cruise, Matilda researched how energy is transferred among the atmosphere, ice, and ocean, an important linkage in the process of global warming.

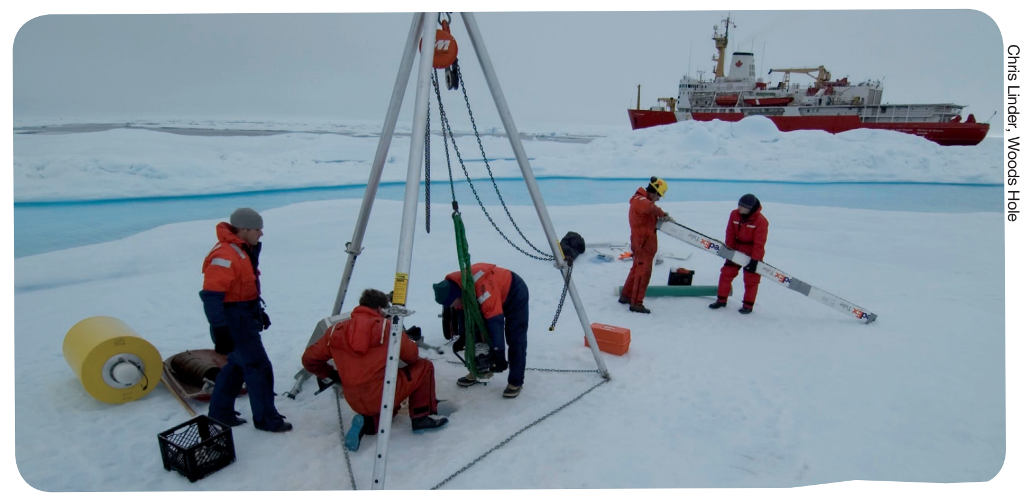
Traditional Arctic knowledge

Hunters and scientists share information about sea ice by looking at maps as part of a research project in Alaska (left). An elder shares his knowledge of the local river systems (right) with a scientist as part of a project in northwestern Canada.

Scientists and indigenous people of the Arctic are learning to work together to combine scientific research with traditional knowledge of the environment. By sharing knowledge, scientists and indigenous people hope to find ways to deal with environmental change.

Henry Huntington

Sonia Wesche



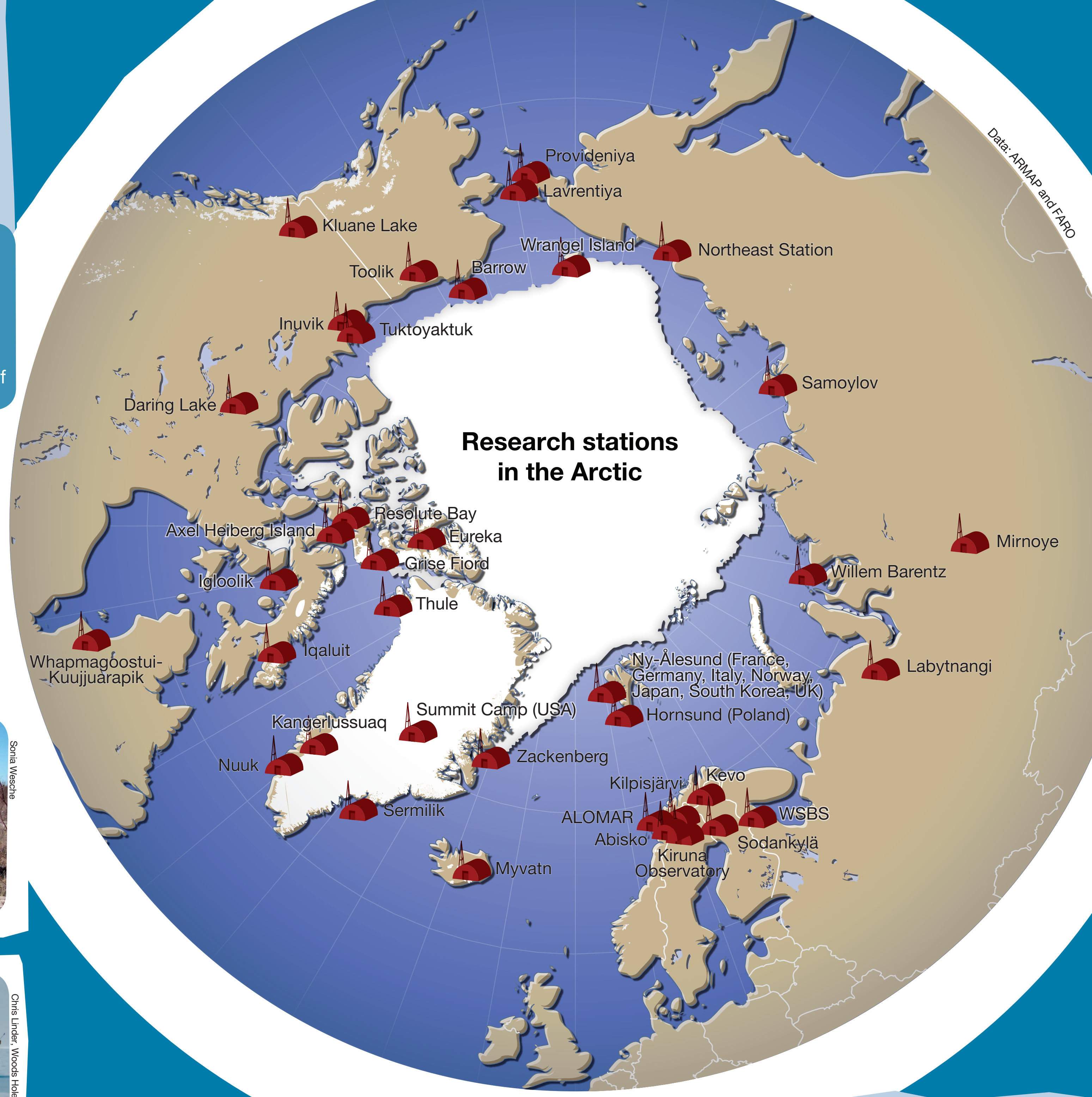
Chris Linder, Woods Hole

Researchers install an automated instrument into Arctic sea ice. It will measure temperature and salinity of the Arctic Ocean for three years. Data collected from such instruments help in understanding the role of the Arctic Ocean in global climate change.

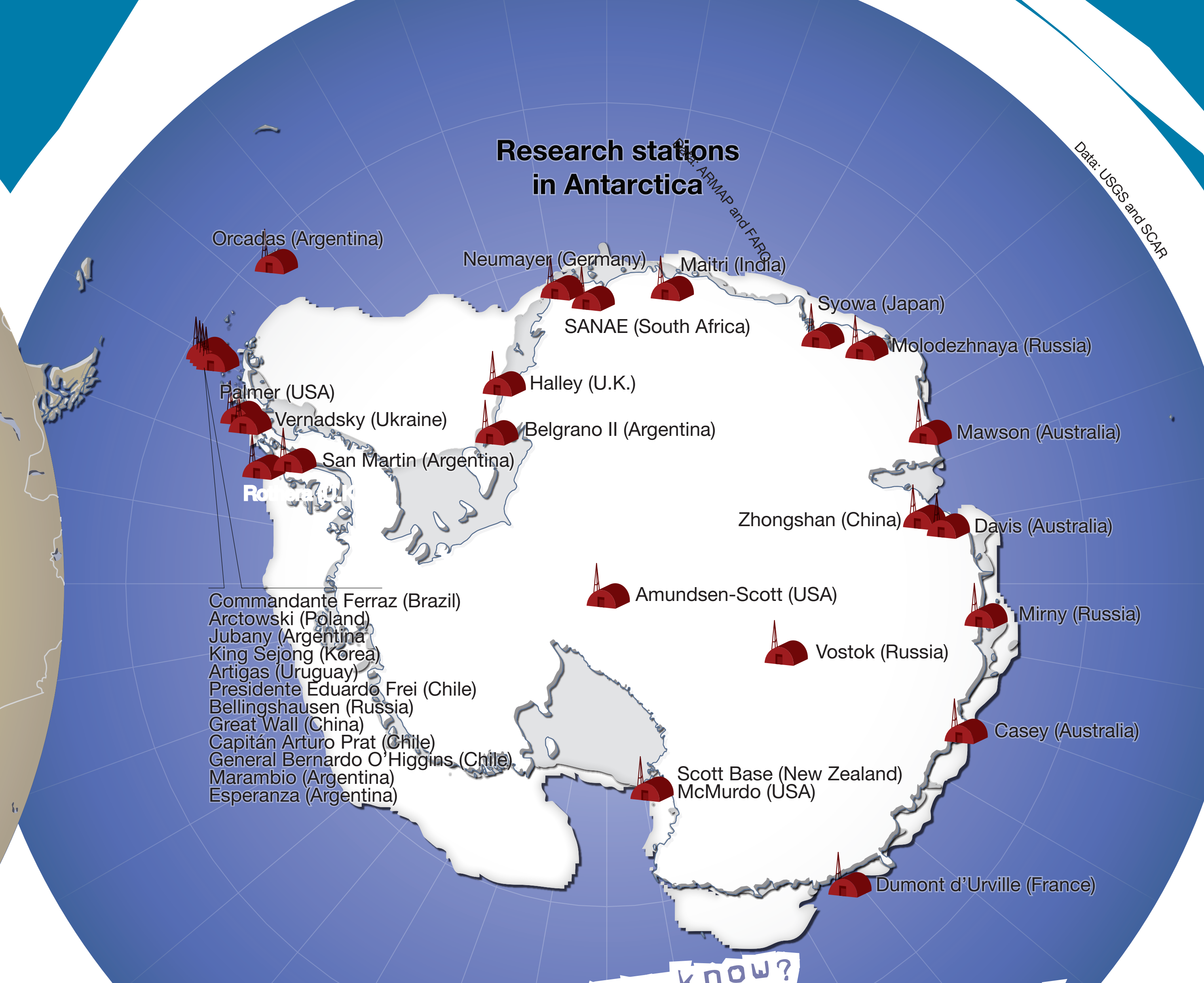
Greening the Arctic

As a result of climate change, vegetation across the Arctic is changing. The Arctic is getting "greener", with denser vegetation and a longer growing season.

D.A. Walker



Research stations in the Arctic
Data: ARMAP and FARO
Provideniya
Lavrentiya
Kluane Lake
Wrangel Island
Northeast Station
Toolik
Barrow
Inuvik
Tuktoyaktuk
Samoylov
Daring Lake
Resolute Bay
Axel Heiberg Island
Eureka
Grise Fiord
Igloolik
Thule
Mirnoye
Willem Barentz
Whapmagoostui-Kuujjuarapik
Iqaluit
Ny-Ålesund (France, Germany, Italy, Norway, Japan, South Korea, UK)
Labytnangi
Hornsund (Poland)
Summit Camp (USA)
Kangerlussuaq
Zackenberg
Nuuk
Kilpisjärvi
Kevo
Sermilik
ALOMAR
WSBS
Abisko
Sodankylä
Kiruna Observatory
Myvatn

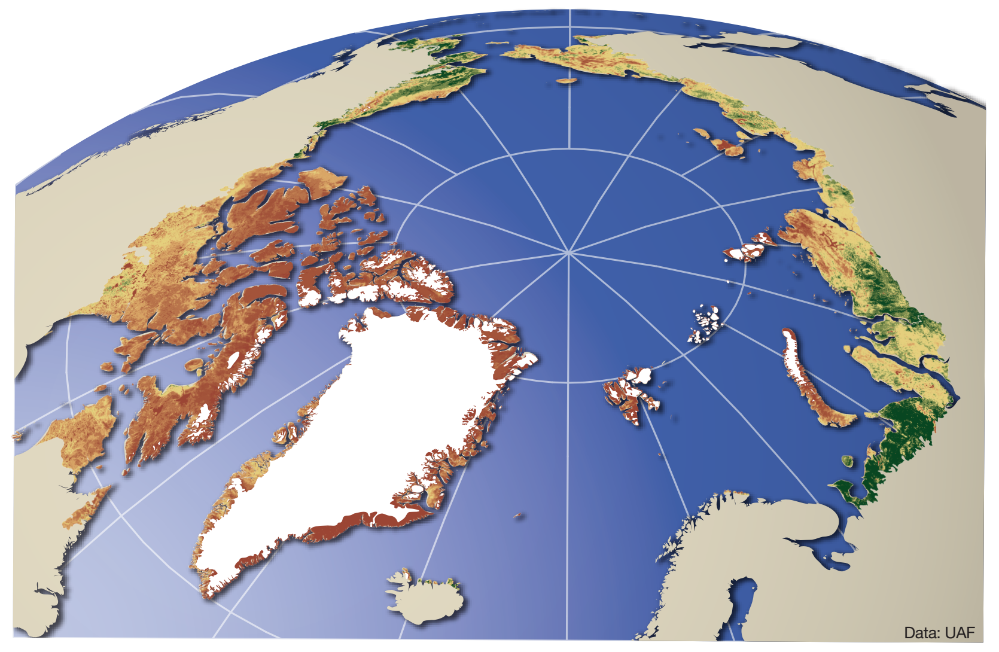


Research stations in Antarctica
Data: ARMAP and FARO
Data: USGS and SCAR
Orcadas (Argentina)
Neumayer (Germany)
Maitri (India)
SANAE (South Africa)
Syowa (Japan)
Molodezhnaya (Russia)
Palmer (USA)
Halley (U.K.)
Vernadsky (Ukraine)
Belgrano II (Argentina)
Mawson (Australia)
San Martin (Argentina)
Zhongshan (China)
Davis (Australia)
Commandante Ferraz (Brazil)
Arctowski (Poland)
Jubany (Argentina)
King Sejong (Korea)
Artigas (Uruguay)
Presidente Eduardo Frei (Chile)
Bellingshausen (Russia)
Great Wall (China)
Capitán Arturo Prat (Chile)
General Bernardo O'Higgins (Chile)
Marambio (Argentina)
Esperanza (Argentina)
Amundsen-Scott (USA)
Mirny (Russia)
Vostok (Russia)
Casey (Australia)
Scott Base (New Zealand)
McMurdo (USA)
Dumont d'Urville (France)

Did you know?

The Greenland and Antarctic ice sheets contain 98 to 99% of the freshwater ice on Earths surface. If the ice sheets were to melt completely, sea level would rise by about 64 m

On the Yamal Peninsula in northern Russia, changing vegetation affects the reindeer herds and Nenets people who depend upon them. As part of the "Greening of the Arctic" initiative of the International Polar Year, scientists are looking at satellite images, measuring vegetation in the field, and interviewing local indigenous people to find out more about these vegetation changes.



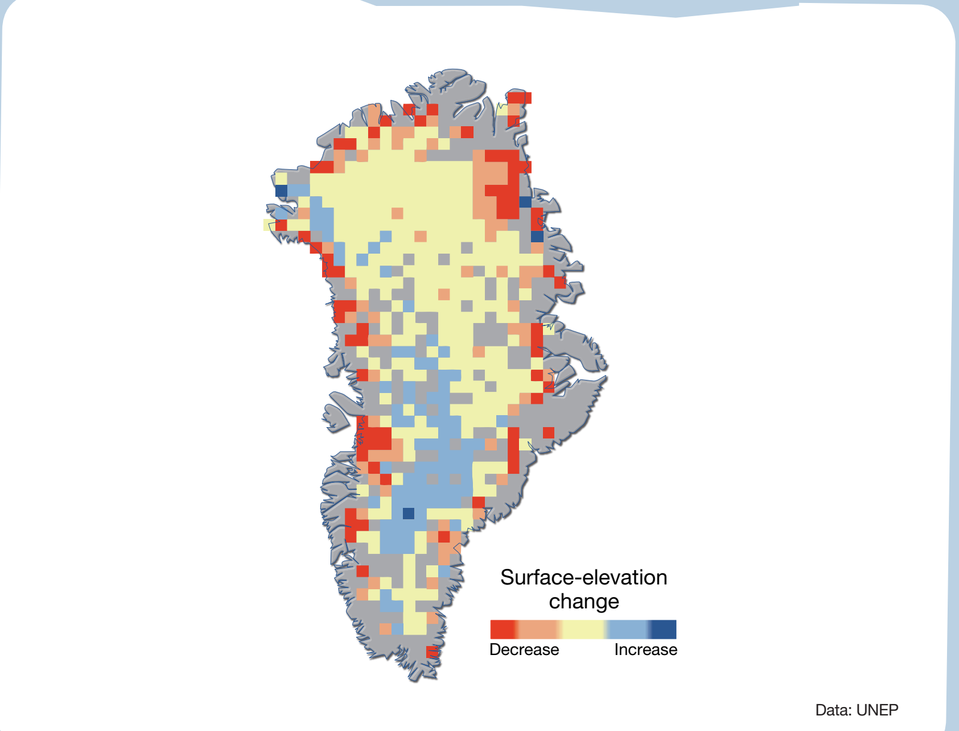
Data: UAF

This image shows the condition of vegetation, or "greenness", in the Arctic based on data from satellites. The areas with higher NDVI (Normalized Difference Vegetation Index) values are greener.

How to tell if an ice sheet is growing or shrinking

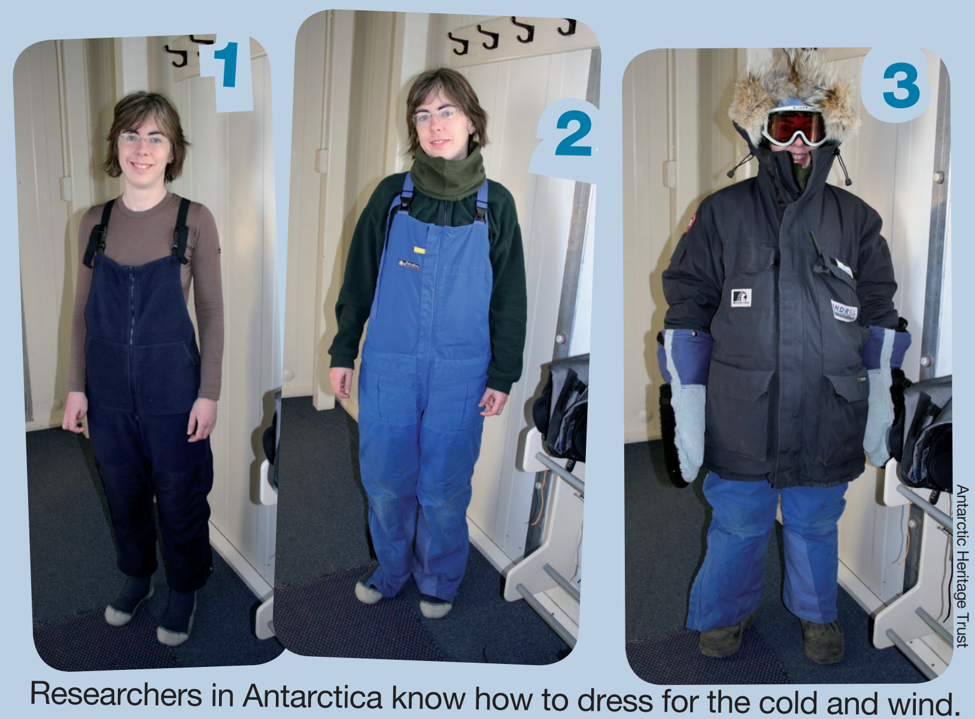
Most of Greenland and most of Antarctica are covered by masses of freshwater ice called ice sheets. Currently, warmer ocean waters and increasing summer air temperatures are causing the ice sheets to lose ice at rates that are increasing with time. Will ice loss from the ice sheets continue to accelerate? Scientists are trying to find out.

British Antarctic Survey



Surface-elevation change
Decrease
Increase
Data: UNEP

This image shows the rates at which the surface elevation of the Greenland Ice Sheet changed between the late 1990s and 2003, based on laser measurements from satellites and aircraft. The middle of the Ice Sheet is thickening, but this is outweighed by thinning of the Ice Sheet near the coast.



Antarctic Heritage Trust

Researchers in Antarctica know how to dress for the cold and wind. Layering is important:

1. Thermal underwear

2. An insulating layer of wool or fleece

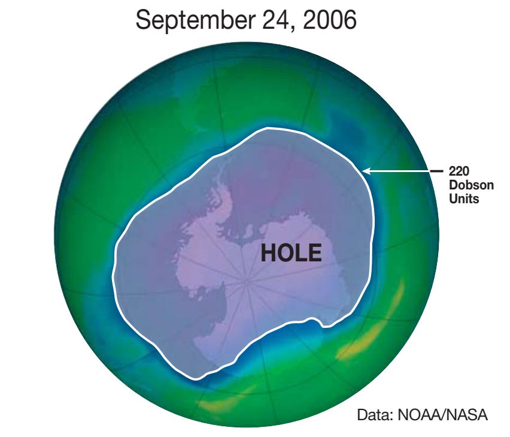
3. Waterproof and/or windproof material, plus a good hat, boots, goggles, and gloves!

An Antarctic discovery: the ozone hole

The ozone hole, a dramatic drop in springtime ozone levels over Antarctica, was discovered in 1985. The ozone hole harms life by allowing more ultraviolet radiation to reach Earth's surface.

In 1987 many countries signed the Montreal Protocol, an agreement to release fewer chemicals such as chlorofluorocarbons (CFCs) that destroy the ozone layer. As a result, the ozone hole is expected to decrease in size over the next few decades.

Tamsin Gray



September 24, 2006
220 Dobson Units
HOLE
Data: NOAA/NASA

From September 21-30, 2006, the average area of the ozone hole was the largest ever observed.

Researchers in Antarctica monitor ozone levels using an instrument called a spectrometer.

Dominick Dirksen/NSF

Most research in Antarctica happens during the Antarctic summer from October to March. During the summer, more than 1000 people live at the largest research station on Antarctica, McMurdo station.

INTERNATIONAL 2007 2008
POLAR YEAR
www.IPY.org

International Polar Year (IPY) 2007-2008 is a two-year international programme of polar research. IPY facilitates cooperation among nations and researchers in order to better understand the role that the Arctic and Antarctic play in the world. IPY is also a way to get a new generation of researchers involved in polar research and to get the public excited about polar issues!

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